SCREEN AND PROCESS FOR MANUFACTURING A SCREEN OF THIS KIND

Cross-Reference to Related Applications

This application is a continuation-in-part of copending United States Patent Application Serial Number 09/776,320 filed February 2, 2001.

Background of the Invention

This invention relates generally to apparatus for cleaning pulp suspensions. More particularly, the present invention relates to screens for cleaning pulp suspensions process for manufacturing screen of this kind

Various types of screen are known. For example WO 98/14658 discloses a screen which comprises a number of rods and supporting elements, where the supporting elements have slots. In this case the supporting elements take the shape of a U-shaped profile, which means that part of these rods must undergo plastic deformation in order to secure the rods to the supporting elements. A different kind of screen is known from DE 44 35 538 A1 which discloses rods secured with positive locking by clamping due to plastic deformation of the rod-supporting elements. In addition flat or cylindrical (centripetal or centrifugal) screens are known, where the rods are attached by welding to the rod-supporting elements. This form of fastening, however leads to a series of disadvantages because considerable welding stress is transferred to the components during welding and this causes distortion of the entire screen body. Furthermore, the fastening effect is not always guaranteed because the welds may begin to break up under certain circumstances and in the course of time due to signs of wear. The manufacturing process itself is actually very complicated and time consuming, and it Is very difficult in particular to set the supporting width precisely between two adjacent screen rods.

Summary of the Invention

The aim of the invention is thus to create a screen that does without plastic deformation of the rods and/or supporting elements and without welds. In addition, a simple manufacturing process for this type of screen is to be developed.

The invention is thus characterized by the rods having protrusions in the side walls which extend into inversely shaped recesses in the supporting element. Thus, a fixed connection can be created with form closure without the need for welding or plastic deformation.

An advantageous further development of the invention is characterized by the protrusions being circular or elliptical and preferably having a radius r of 0.1 mm $< r <$ 2 mm. As a result, it is possible to mount the rods easily without deformation of the supporting elements, which also permits manufacture at low cost. The rods can be inserted easily, whereby the circular or elliptical formed protrusions lead to a more even area pressure and therefore to a good fixed connection with the supporting elements.

An advantageous configuration of the invention is characterized by the spacing h_1 between the protrusions and the imbedded end of the rod preferably measuring at least 0.1 mm $< h_1 <$ 6 mm. This makes the rod more resistant to vibration.

A favorable configuration of the invention is characterized by three or more protrusions with the respective recesses being provided on one side wall. This means that a secure form closure can be achieved.

A favorable further development of the invention is characterized by a different number of protrusions being provided on either side of the rods. This guarantees a better fastening effect en the event of one-sided inflow.

An advantageous further development of the invention is characterized by the supporting elements having a T or I shape. These shapes provide a larger screen area.

A favorable configuration of the invention is characterized by the rods, which have a total height H, protruding into the supporting element to a height h, where the relationship of h to H is preferably greater than 0.5. This protects the rod more effectively against flow forces.

An advantageous configuration of the invention is characterized by the bottom part of the rod being pressed together with the supporting element. This provides even better stability at higher forces.

The invention also refers to a process for manufacturing a screen of this kind, characterized by the supporting elements being bent open elastically and the rods inserted, whereupon the supporting elements spring back, encircle the rods positively and form a screen mat. Thus, a screen mat can be formed easily without welding or pressing, where it is possible to position the rods exactly and thus, obtain low tolerances.

An advantageous further development of the invention is characterized by the screen mat being rolled together to form a cylinder

Brief Description of the Drawings

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawings in which:

Figure 1 is a cross section view of a screen mat in accordance with the invention; and

Figure 2 is a cross section view taken along line II-II of Figure 1.

Detailed Description of the Preferred Embodiment

Figure 1 illustrates an example of three rods 1, mounted in supporting elements 2. The right-hand rod 1 shows that it has several protrusions 3 with a radius r on both side walls. The supporting element contains recesses 4 with exact inverse shaping and the necessary clearance distances in relation to the screen basket diameter. The present illustration shows two protrusions and two recesses on each side, however there can also be three or more such protrusions and recesses if necessary. The number of protrusions on either side may also differ. These protrusions with a circular or elliptical segment shape have a radius r to which 0.1 mm $<$ r $<$ 2 mm applies. The rods can be inserted easily, whereby the circular or elliptical formed protrusions lead to a more even area pressure and therefore to a good fixed correction with the supporting elements.

The middle rod in Figure 1 shows the length measurements of the rod, which has an overall height H. The protrusions are spaced at a distance h_1 to which 0.1 mm $< h_1 <$ 6 mm applies, from the imbedded end of the rod. The rod 1 projects into the supporting element with a height h, where the ration of h to H should preferably be larger than 0.5. When the screen mat 10 is rolled to form a cylindrical screen basket, the surfaces 5 of the supporting element 2 are pressed into engagement with the projecting section of the rod on the side facing away from the direction of flow F, and exert a clamping force 11 on the rod 1 to obtain better fastening. This applies if the supporting element 2 is made in a T shape. If an I shape is used, the rod 1 is not pressed together. The supporting element 2 can also be made in other shapes than a T or I, e.g. square. rectangular. square with rounded corners, rectangular with rounded corners, with the rounding on only one or on several corners.

The protrusions provided in the supporting element 2 to hold the rod 1 can have clearance equivalent to the angle α on the side facing

away from the flow. With the cylindrical shape of the screen basket this avoids plastic deformation in the supporting element 2. Clearance angle α has a value of one to ten degrees, preferably two to five degrees. Most commonly, clearance angle α has a value of about five degrees.

Figure 2 shows a section through the line marked II-II in Figure 1, where the T shape of the supporting element 2 and one rod 1 are visible. On the surface 5 this rod 1 can be pressed together with the supporting element 2 if necessary.

The rods 1 have a cross-sectional shape that decreases in the direction of flow F. The connection between rods and supporting elements is essentially positive, i.e. without plastic deformation of the individual components or additional connecting links, such as weld seams. A screen of this type can be made, for example, by pressing the rods together with the supporting elements until they lock into place. Another form of manufacture is to bend the supporting elements open elastically so that the receptacle 6 for the rods expand and the individual rods 1 can be inserted. When the supporting elements have sprung back into place, a level (planar) screen mat is formed by the clamped profile rods. Thanks to the above mentioned design as snap connection, this process permits the rods 1 to be inserted precisely into the supporting elements 2, thus lowering the slot width tolerances. If this screen mat is then rolled into a screen basket, the clamping effect is increased further due to the bending radios when the screen is rolled up. Pressing the protruding ends of the rods together with the supporting elements 2 increases the stability of the screen mat further. The supporting elements 2 can also be shaped as rings with the receptacles 6 according to the invention worked into these rings, where the dimensions are somewhat smaller than specified, i.e. the receptacles 6 are slightly smaller than the rods 1. Subsequently the rings are nicked

at one point and bent open far enough for the rods to lock into place. When the rings have bent back into place, they can be welded together to form a basket.

The invention is not limited to the examples presented. On the contrary, the protrusions 3 in the rods 1 can be shaped at will as long as they engage in the inversely identical recesses in the supporting element. The rods 1 can also take any shape from a rectangle to a triangle.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.